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ABSTRACT

Designed to aid in the orientation of personnel newly assigned to the Office of Manpower Utilization (OMU), Marine Corps Headquarters, this manual provides a brief overview of Marine Corps Task Analysis (TA) by presenting the basic steps in this process, which are (1) construct a task inventory, (2) administer self-report inventory, (3) analyze, using the Comprehensive Occupational Data Analysis Programs (CODAP), (4) recommend solutions to identified problems, and (5) secure approval of recommendations. OMU's major goal of improving the utilization of human resources in the Marine Corps is discussed, and the way the staff is organized to accomplish this is presented. Appendixes provide brief descriptions of TA terms and a synopsis of CODAP used to define jobs in an occupational field. (Author/HD)

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INTRODUCTION TO MARINE CORPS TASK ANALYSIS

Training Manual II

Phillip J. Hanson

Technical Report No. 10

EVALUATION OF THE MARINE CORPS TASK ANALYSIS PROGRAM

A Research Project Supported By
Commandant of the Marine Corps (Code RD)
And Monitored By
Personnel and Training Research Programs
Psychological Sciences Division
Office of Naval Research
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California State University, Los Angeles
March, 1976

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This Training Manual is designed to aid in the orientation of personnel newly assigned to the Office of Manpower Utilization, HQMC (OMU). It provides a brief overview of Marine Corps Task Analysis (TA) as it is conducted by OMU. Basic steps in the TA process are: 1. Construct a task inventory, 2, Administer self-report inventory, 3. Analyze, using CODAP, 4. Recommend solutions to identified problems, 5. Secure approval of recommendations. The Manual gives a brief description of each step. OMU's major goal of improving the

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the utilization of human resources in the Marine Corps is discussed, and the way the staff is organized to accomplish this is presented. Appendices provide brief descriptions of TA terms and a synopsis of the Comprehensive Occupational Data Analysis Programs (CODAP) used to define jobs in an occupational field.

SUMMARY

This Training Manual is designed to aid in the orientation of personnel newly assigned to the Office of Manpower Utilization, HQMC (OMU). It provides a brief overview of Marine Corps Task Analysis (TA) as it is conducted by OMU. Task analysis is the identification, collection, collation and analysis of job data. In the Marine Corps TA Program these data represent responses from Marine job incumbents to a comprehensive set of questions aimed at determining: (1) What the Marine really does; (2) Why the Marine does it; (3) How the Marine does it; (4) At what skill level (learner, worker, first-line supervisor or staff supervisor) the Marine performs.

Basic steps in the Marine Corps TA process are: 1. Construct a task inventory, 2. Administer self-report inventory, 3. Analyze using CODAP, 4. Recommend solutions to identified problems, 5. Secure approval of recommendations. This Manual gives a brief description of each step.

OMU's major goal of improving the utilization of human resources in the Marine Corps is discussed, and the way the staff is organized to accomplish this is presented. Appendices provide brief descriptions of TA terms and a synopsis of the Comprehensive Occupational Data Analysis Programs (CODAP) used to define jobs in an occupational field.

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March, 1976

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I

INTRODUCTION

Of major importance to military organizations throughout history has been the use of the right resource at the right time. This becomes especially critical when decisions involve selection of the right man for placement in the right job. Where highly trained individuals are placed in the wrong job, the value of their training is wasted. In turn, effective completion of a job is based upon the clear definition of the job in terms of a set of definite, independent tasks. The performance of these tasks, when appropriately completed, constitutes the very basis upon which the success of military organizations depend.

The contemporary policy of military organizations emphasizes both the correct man and the correct job. In addition, increasing emphasis in recent years has been given to the costs of getting the job done. These costs constitute constraints imposed by budgets. The importance of utilizing the right resource, within budget limits, at the right time, has encouraged the Marine Corps to take positive action to get the right Marine in the right job. One means of using human resources properly is represented by the Marine Corps Task Analysis Program.

Marine Corps Task Analysis (TA) began in October, 1969, and the Office of Manpower Utilization, HQMC (OMU) was assigned responsibility for the conduct of TA studies. The objective was to study all enlisted Marine Corps Occupational Fields (OF's, or OFs). This objective was designed to provide the basis for identification, collection, collation, and analysis of relevant job data.

Since October, 1969, a large and growing number of Marine Corps occupational fields has been studied. The results of these studies are far-reaching in providing a basis for realistically defining the tasks involved in a job and in identifying the set of jobs that make up OF's in the Corps. Recommendations based upon these results have provided the basis for savings in both manpower and financial resources.

The Marine Corps TA program collects factual job data as the basis for defining individual work actions. These work actions may be referred to as jobs, duties, tasks, or elements of tasks. The focus of earlier TA studies was on the tasks performed in individual Marine Corps Occupational Fields (OFs). Although tasks are still the basic units of TA studies, the overall focus of the program has broadened. OMU has been asked on several occasions to conduct TA studies and analyses of MOS's that cut across OF boundaries. This trend is expected to continue.

OFs are defined as consisting of a set of basic jobs. Jobs consist of a set of basic duties that are further defined as a grouping of a variety of related tasks. A job may include several duties that:

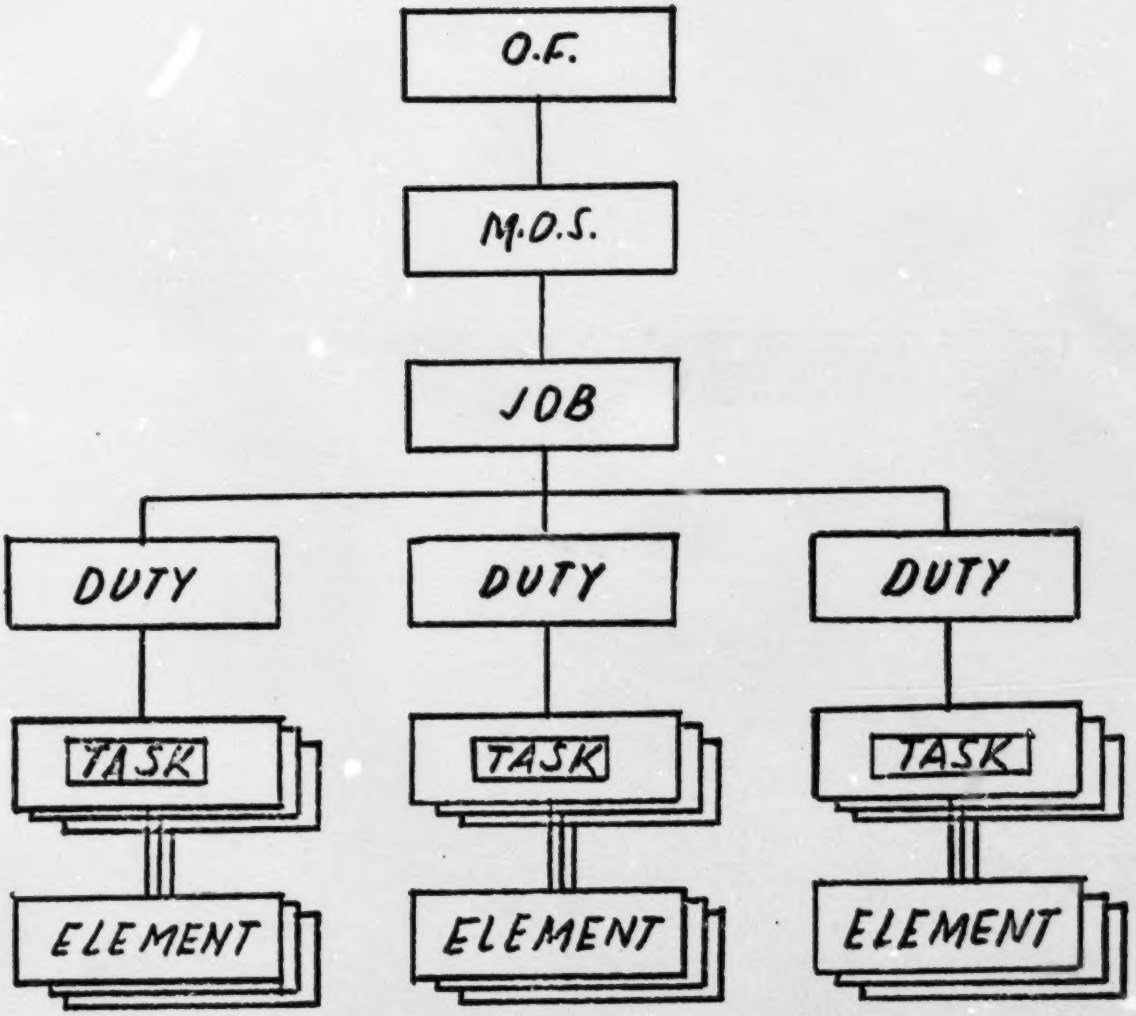
- are recognized as being a Marine's principal responsibility.
- require a significant portion of the Marine's time.
- occur reasonably frequently in the work cycle.
- involve work operations that utilize related skills, knowledge, and abilities.
- are performed for a defined purpose by a selected method to meet a set standard.

The tasks within each duty are those that require a considerable portion of time spent performing the duty, occur reasonably frequently in the work cycle of the duty, involve closely related skills, knowledges, and abilities, and are performed to some set of standards. Tasks can be further divided into subtasks or elements. The Marine Corps program of analysis, however, studies the task level. The program is therefore referred to as "task analysis" instead of as "job analysis", "occupational analysis" or element analysis". The relationships among jobs, duties, tasks and elements are shown in Figure 1 on page 4.

Task analysis is used in other military services, and in private organizations. Its use in the Marine Corps differs somewhat from its application in some other organizations. The difference may be described by saying that in the Marine Corps, TA means the identification of tasks performed in a job (MOS) and the relative amount of time spent in performing these tasks.

Two terms that are important in the TA program are methodology and analysis. The TA methodology is a set of fixed procedures that are followed in completing each study of an OF. The term "methodology" is used because it generally refers to a precise manner of performing a set of tasks. The methodology (TA procedures) used constitutes the basic way of doing business. As jobs can be broken into elements, methodology can be broken down into a series of definite and individual steps. The methodology used in the TA program is described in Section II of this manual.

Figure 1



Job Components--Duties, Tasks, and Elements

The second term of importance used in this manual is analysis. Analysis comprises a large area. In OMU's program, analysis refers primarily to two activities. One activity is wholly and exclusively human oriented, and the other activity relies upon the use of a computer. The computer based analysis produces results of a statistical nature. These results in turn are analyzed using common sense and seasoned judgment by the Marines working in the TA program. The role of analysis in the task analysis methodology is described starting on page 13. Other important TA terms are defined in Appendix A.

The task analysis program has resulted in substantial cost savings for the Marine Corps. Efforts to generate further cost savings and improve efficiency in the use of resources will continue in the future. In addition, the emphasis of the TA program will continue to be on the evaluation of manpower needs and on allocations in terms of the jobs that the Marine Corps is expected to perform. To the extent that these assignments continue, efforts in the TA program will be directed to the improvement of overall Marine Corps capabilities and performance.

II

TASK ANALYSIS METHODOLOGY

The basic TA objective is to study each Marine Corps enlisted occupational field (OF). Exceptions to this objective have been made in response to specific requests from several Marine Corps commands. Such exceptions have included the study of officer MOS's, combinations of occupational fields, and specific occupations not associated with a single occupational field or MOS.

A second objective, which is part of the first, is to use the results of each OF study as a basis for making recommendations to improve the allocation of scarce manpower resources based upon capabilities. This objective is fulfilled by the identification, collection, collation, and analysis of job data. The overall objective of task analysis may be stated as:

- To study job and task data for each Marine Corps occupational field as a basis for making recommendations concerning organization, training and manpower utilization.

While military commanders have attempted to do this for some time, it is only within recent years that computer systems and analysis techniques have permitted studies of this type to be done in depth. As a result, a subsidiary objective of task analysis is to employ recent technology and techniques to improve occupational field studies. In

fulfilling these objectives it is important to identify what this program is not, as well as what it is. In the conduct of the TA program OMU emphasizes that:

- TA teams are not inspectors.
- TA teams are not time or motion study technicians.
- TA teams are not efficiency experts.
- TA teams do not evaluate individual units.
- TA teams do not audit standard operational procedures of a Marine Corps unit or command.
- TA teams do not evaluate individual proficiency.

OMU is not in the business of inspecting the internal efficiency and effectiveness of individual operating units.

Task analysis aims to determine what jobs exist, their nature, their relationships, and the types of individuals involved in those jobs. In developing these job and task data, the TA program must look at individual activities. In doing this it obtains responses from Marine job incumbents to a comprehensive set of questions aimed at determining:

- What the Marine really does.
- Why the Marine does it.
- How the Marine does it.
- At what skill level (learner, worker, first-line supervisor or staff supervisor) the Marine performs.

Data thus obtained by OMU affect many units of the Marine Corps and in a number of ways. One is the effect upon Marine Corps-wide training programs even though TA's principal orientation is not training - it is overall manpower utilization. OMU, through TA, also seeks to improve Marine Corps effectiveness in the areas of classification, assignment, training, MOS/grade structure, job requirements, and job validation.

In fulfilling the fundamental objectives of task analysis, a definite methodology is used. This methodology involves a number of sequential steps. The exact number of the steps may vary as a function of the specific OF being studied. The number and nature of the steps may also vary over time based upon changes in organization and headquarters requirements. Nonetheless, the methodology that is employed consists of an inter-related set of steps which, no matter how they change, result in observations concerning tasks and jobs in the Marine Corps and the way in which improved identification of those tasks and jobs will improve the overall effectiveness of the Corps.

As originally conceived, the methodology for Marine Corps task analysis consisted of seven steps. These steps were applied to individual OF's with varying degrees of precision and exactitude. The original seven steps or activities are now described by OMU as five steps that make up the TA methodology. However, this does not represent a basic change in the TA process. Three of the earlier seven steps, the Study Phase, Observation and Interviewing, and Task Inventory Construction, are now a part of Step 1 of the five step process.

The five steps are listed below and are followed by summary descriptions of each step.

TASK ANALYSIS PROCESS

1. Construct a task inventory
2. Administer self-report inventory
3. Analyze, using CODAP
4. Recommend solutions to identified problems
5. Secure approval of recommendations

Step 1, Construct a Task Inventory

The objective of this step is to develop an inventory, or questionnaire, that will list all tasks any Marine in any MOS in an OF performs as part of his job. The basic purpose is to find out what tasks Marines in an OF actually do.

The task analysis questionnaire is an extensive list of questions, phrased as task statements within various duty areas, and questions concerning the background and experience of those who will be asked to complete the inventory. At the time this is written, the typical task inventory, or task analysis questionnaire, contains four sections. They are:

- Part I. Background information concerning education, months of experience in the OF, paygrade, MOS, and similar data.
- Part II. General inquiries concerning hardware experience, service school training, etc.
- Part III. Task Statements.

Part IV. Questions concerning job satisfaction/ dissatisfaction.

Since the TA questionnaire is the principal tool for collecting data concerning occupational fields, it is of primary and persistent importance to success of the TA mission. Because of its importance, a great deal of time and effort are required in its preparation. Furthermore, much time and effort are given to reviewing the questionnaire to ensure that extraneous, unimportant questions are not asked, and that questions regarding important tasks for jobs are clearly stated so that they may be easily understood by the Marines who will be asked to answer them.

During the first part of constructing a task inventory a team of OMU analysts gathers all available information about an OF. The data reviewed include positions and billets, programs and outlines of instruction, technical manuals, standard operating procedures, and other published material related to the OF being studied. As the study progresses, the analysts seek information, assistance, and general guidance from Marine occupational field specialists, OF sponsors and monitors, and other HQMC agencies concerned with the OF being analyzed. TA teams visit military and civilian schools that provide specialized training for Marines in the OF to gain first-hand knowledge about the materials being taught and the techniques being used.

The data thus gathered are then assembled to create a preliminary task list. The list reflects tasks in the OF that are performed by

incumbents of different MOS's. This list of tasks is reviewed with "experts" in the OF and further refined. Some experts may suggest additional tasks not on the list in addition to commenting about those given to them for review. Others may suggest elimination of some task statements. However, at this stage of the study, OMU analysts follow the general rule that no tasks should be deleted. Tasks are only deleted after visits to a representative group of Marine Corps commands show that they are not performed by Marines in the OF.

The next phase of this first step is critical in gathering the final data that will be used in construction of the finished task inventory. OMU analysts visit selected Marine Corps commands and observe and interview Marines in the OF as they actually perform their work. All pay grades in each billet and MOS are interviewed and observed so that the OF is completely represented in the study. This portion of the study has been traditionally called the Observation and Interview, or "O&I", phase by OMU staff members.

The TA analysts who observe and interview Marines in their working environments take with them the preliminary task list prepared from initial studies of the OF. The list is corrected and validated on the basis of first-hand information obtained from Marines by the O&I process.

Of equal if not greater importance is the identification of tasks being performed in the OF that were not uncovered during preliminary studies prior to the field visits. Many tasks are discovered during O&I

that do not show up in initial studies. Notes are made of these tasks, and O&I team members may prepare "rough draft" statements, while still at a base, for further refinement upon return to Quantico.

Following return of the TA analysts from the O&I trips, the difficult task of preparing the final task inventory for the OF begins. Each O&I analyst reviews his notes prepared on the trip and prepares a list of task statements based upon the information he gathered. A group meeting is then held of all of the OMU members involved in the OF study. Task statements prepared by different analysts are compared, revisions are made as needed, and when agreement is reached among all involved, the final set of task statements for the OF is written. These task statements are the most important part of the questionnaire that will be administered to a representative sample of Marines in the OF.

After final draft of the task inventory has been typed, it may be reviewed with OF experts before being printed in booklet form for administration to Marines in the OF. This is the final check on the accuracy of the inventory.

Step 2, Administer Self-Report Inventory

Before O&I visits are scheduled, a careful study is made by OMU analysts of the Marine commands at which members of the OF under study are stationed in order to plan trips to facilities that have an adequate number of Marines in the different MOS's of the OF. Representative samples of Marines in the OF at those bases are then selected. OMU staff members are assigned

to administer the inventory. They travel to the selected Marine Corps facilities and administer the questionnaire to incumbents of the OF. Each Marine records his responses in the task inventory booklet that contains both the task statements and other questions, and spaces for answers on the same page as the questions.

Each completed booklet thus creates a unique job description, since it specifies the work activities of one Marine in the OF and shows how his time is distributed among the tasks listed. Each task statement and other items in the questionnaire are "pre-coded" with special numbers to facilitate transfer of responses to the computer. A sample page from a task inventory questionnaire is shown in Figure 2.

Completed task inventory booklets are reviewed by task analysts to ensure completeness and legibility. This is done in the field immediately following administration of the inventories. After return of the booklets to OMU, answers in each booklet are transferred for direct storage on computer disks by a process called the key-to-disk method. In this form of data storage they are readily accessible for subsequent processing by the computer.

Step 3, Analyze, Using CODAP

The initial and most important phase of analyzing task inventory data is the use of specially designed computer programs that are collectively referred to as CODAP. The letters CODAP stand for Comprehensive Occupational Data Analysis Programs. CODAP is actually a collection of a large number

	CHECK IF DONE	1 VERY LITTLE 2 BELOW AVERAGE 3 SLIGHTLY BELOW AVG 4 AVERAGE 5 SLIGHTLY ABOVE AVG 6 ABOVE AVERAGE 7 VERY MUCH	
109 RECOMMEND ESTABLISHMENT OF CIVILIAN BILLETS		1 2 3 4 5 6 7	4/17
110 SUPERVISE CIVILIAN PERSONNEL		1 2 3 4 5 6 7	4/18
111 SUPERVISE PREPARATION OF REPORTS		1 2 3 4 5 6 7	4/19
112 INTERPRET ORDERS, BULLETINS, AND DIRECTIVES FOR SUBORDINATES		1 2 3 4 5 6 7	4/20
113 REVIEW MESSAGES/CORRESPONDENCE FOR COMPLETED ACTION		1 2 3 4 5 6 7	4/21
114 SCHEDULE LEAVES/LIBERTY		1 2 3 4 5 6 7	4/22
115 MONITOR ROUTING OF CORRESPONDENCE		1 2 3 4 5 6 7	4/23
116 PROOF READ		1 2 3 4 5 6 7	4/24
117 PROJECT PERSONNEL LOSSES/REQUIREMENTS		1 2 3 4 5 6 7	4/25
118 ESTABLISH REPORTS CONTROL PROCEDURES		1 2 3 4 5 6 7	4/26
119 SCHEDULE DAILY SHOP OR SECTION WORK ROUTINE		1 2 3 4 5 6 7	4/27
120 SUPERVISE PREPARATION AND MAINTENANCE OF RECORDS		1 2 3 4 5 6 7	4/28
121 RECOMMEND T/O CHANGES		1 2 3 4 5 6 7	4/29
122 RECOMMEND PERSONNEL FOR MOS CHANGE		1 2 3 4 5 6 7	4/30
123 PREPARE/SUBMIT INVESTIGATION REQUESTS		1 2 3 4 5 6 7	4/31
124 EVALUATE PERFORMANCE OF MILITARY SUBORDINATES		1 2 3 4 5 6 7	4/32
125 ANALYZE SECTION WORK LOAD REQUIREMENTS		1 2 3 4 5 6 7	4/33

Figure 2. Sample Page from Task Analysis Questionnaire Booklet

of independent computer programs. These computer programs provide various capabilities for the organization and analysis of data. Some of these capabilities are listed in Table 1 and defined briefly in Appendix B.

The main purpose of the computer programs is to analyze and summarize data in a form that may be readily used by task analysis team personnel. The computer programs produce a series of printouts that provide a graphic method of displaying the original questionnaire responses. The general flow of computer processing is shown in Figure 3. A sample of part of one computer printout that is used for cluster analysis is given in Figure 4.

An important part of the analysis phase consists of using computer generated outputs for purposes of describing and summarizing characteristics of an occupational field. The analysis relies upon the computer printouts available from the CODAP programs. The specific computer printout used depends upon the type of questions to be answered. The questions that must be answered determine the way in which the computer is told to generate printouts.

The CODAP computer programs are used to discover job differences, job similarities, or other comparisons that may be desired by the analysts. The purpose of the analysis is to answer the question: What do Marines in the OF really do on their jobs? This question may be regarded as the underlying hypothesis to be studied by task analysis.

1. Input Standard (INPSTD)

1a. FORMAT (a subroutine of INPSTD)

2. Print Dictionary (PRTDIC)

3. TITLES

3a. Decode TITLES (another subroutine of INPSTD)

3b. History Data File (HDF) (This is the essential product needed before manipulation of data can begin)

4. Volume Setup (VSETUP)

5. Overlap and Group (OVLGRP)

6. Group Member (GRPMBR)

7. Diagram (DIAGRM)

8. Print Variables (PRTVAR) Standard and Special

9. Job Descriptions (JOBDEC)

10. Variable Summary (VARSUM)

11. Group Summary (GRPSUM)

12. Group Difference (GRPDIF)

13. OVERLAP JOB DESCRIPTIONS (OVLJDF)

14. Primary Task Report (PRITSK)

15. Group Variable (GRPVAR)

16. Stepwise Multiple Linear Regression (STPREG)

17. Individual Job Description (INDJOB)

18. Input Secondary Factor Data (INSFAC)

19. Analysis of Secondary Factors (ASFACT)

20. Main Problem to Extract and/or merge Cases from History Data Files (EXTRCT)

21. Add Job Description to History Data File (ADDJOB)

22. Variable Generation, main program (VARGEN)

23. Report, Edit or Print Main Program (REPORT)

Table 1. Partial List of CODAP Computer Programs

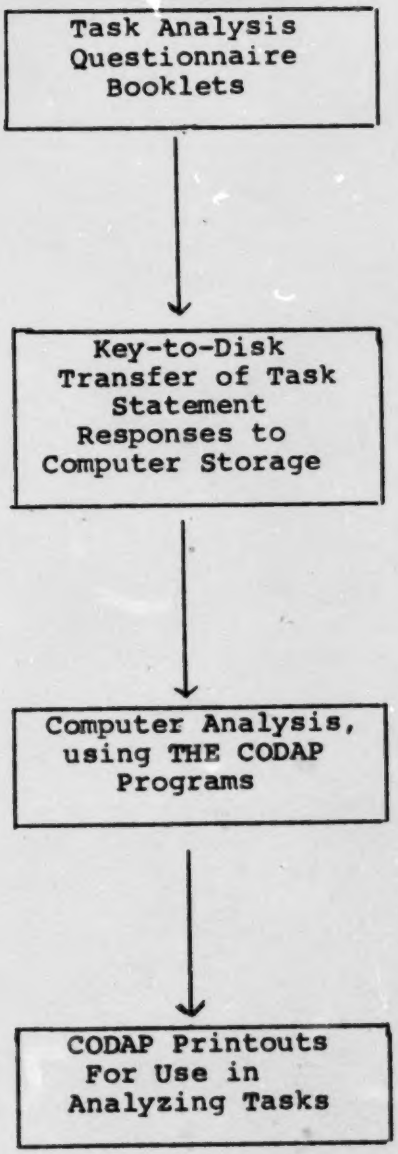

Task Analysis Questionnaire Booklets
Key-to-Disk Transfer of Task Statement Responses to Computer Storage
Computer Analysis, using THE CODAP Programs
CODAP Printouts For Use in Analyzing Tasks

Figure 3. Sequence for Processing Responses to Task Analysis Questionnaires

COLUMN 1==========STUDY IDENTIFICATION IS STUDY-ID.NUMBER OF CASES IS 20.

THIS IS THE PAGE HEADING CARDS
MINIMUM OF 1 CARD
MAXIMUM OF 6 CARDS

STARTING GROUPS SELECTED FROM PREFERRED BEST OF 95.52 AT STAGE 14,MINIMUM BEST OF 95.00,MINIMUM GROUP MEMBERSHIP OF 2

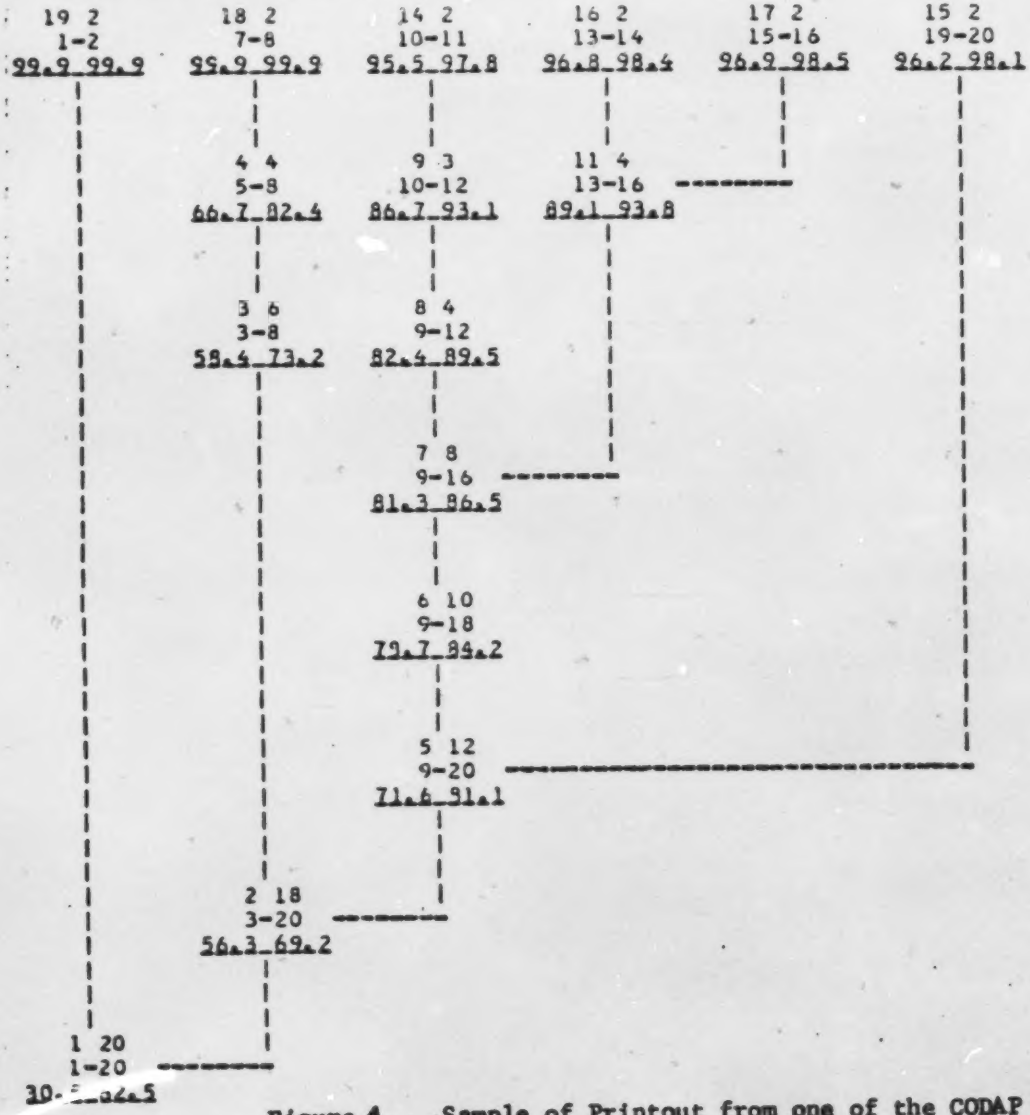


Figure 4. Sample of Printout from one of the CODAP Programs

Step 4, Recommend Solutions to Identified Problems

The end-product of the task analysis of an OF is a final report. The report summarizes the findings and conclusions of the study and identifies areas in which improvements could be made. Recommendations are given for solution of identified problems. The recommended solutions, if adopted, may affect such areas as the overall organization of the OF, specific duties in each MOS, training requirements, classification, and assignment. The report is designed for review by a number of Marine Corps agencies. This review is an important part of the task analysis process. It provides evaluations by Headquarters staff and other staff agencies interested in the OF of OMU's findings, conclusions and recommendations.

The recommendations contained in the final report have wide ranging implications. Some of the more important are recommendations to improve the functional areas of:

- Classification of Marines into various occupational fields and military occupational skills.
- Assignment of these Marines to specialized service schools, on-the-job training, and to various billets.
- Training: Evaluation of the contributions and use of service schools and courses of instruction--including their modification, conception, creation, development, and sometimes deletion.

- Grade and MOS Structure, that may be created, modified, and/or deleted as necessary.
- Jobs are Validated and individual jobs are defined using new job descriptions developed from the TA study.

Other areas that could be affected by recommendation in the final report include force structure, man/machine trade-offs, tables of organization, equipment specifications, and logistic support requirements.

Step 5, Secure Approval of Recommendations

The broad impact of recommendations from task analysis studies of an OF makes it important to obtain agreement, or concurrence, from all levels of command concerned with the OF. Where nonconcurrences arise they must be recognized, understood, and resolved.

Concurrences are obtained and non-concurrences are resolved through staff meetings with each of the Headquarters agencies whose "non-concurrence" could "kill" any recommendation. This process is generally referred to as "staffing". Usually, three or four staffings are involved (and sometimes more), with partial revisions to the final report to be submitted to the Chief of Staff made between staffings. This is a lengthy process. It can last from six months to well over a year, depending upon the complexity of the study and its implications for change. More time is spent on this last phase of the study than in the first four phases combined.

The last step is thus important in the refinement of recommendations prior to final decisions on them by the Chief of Staff, HQMC. Recommenda-

tions that are approved by the Chief of Staff are forwarded to the Director of the MP Division who monitors the implementation of approved recommendations from TA studies of OFs to ensure that effective action is taken. Directives and training guidance in keeping with the new or modified OF requirements are instituted by Headquarters. The job data are then made available upon request to functional area managers, field commands, and schools.

By the end of 1975, OMU had made 302 recommendations based upon TA studies, and 300 of these had been approved and ordered implemented. Millions of dollars have been saved as a result of these recommendations.

The TA methodology is somewhat more complex than the preceding description may suggest. Each of the five major steps consists of many individual activities. This brief orientation manual is not designed to describe each of these separate activities in detail. Some idea of their scope may be obtained by reviewing the flowchart in Figure 5. Even though this flowchart may appear complex, it follows the same logic and sequence as the five steps described in this manual.

The bibliography attached to this report contains references to materials that are readily available to OMU staff members and can provide further insights into the various phases of the TA process. These materials are both from DOD and Marine Corps sources and from Training Manuals and other Technical Reports that were prepared by the Cal State LA research staff that studied the Marine Corps TA program.

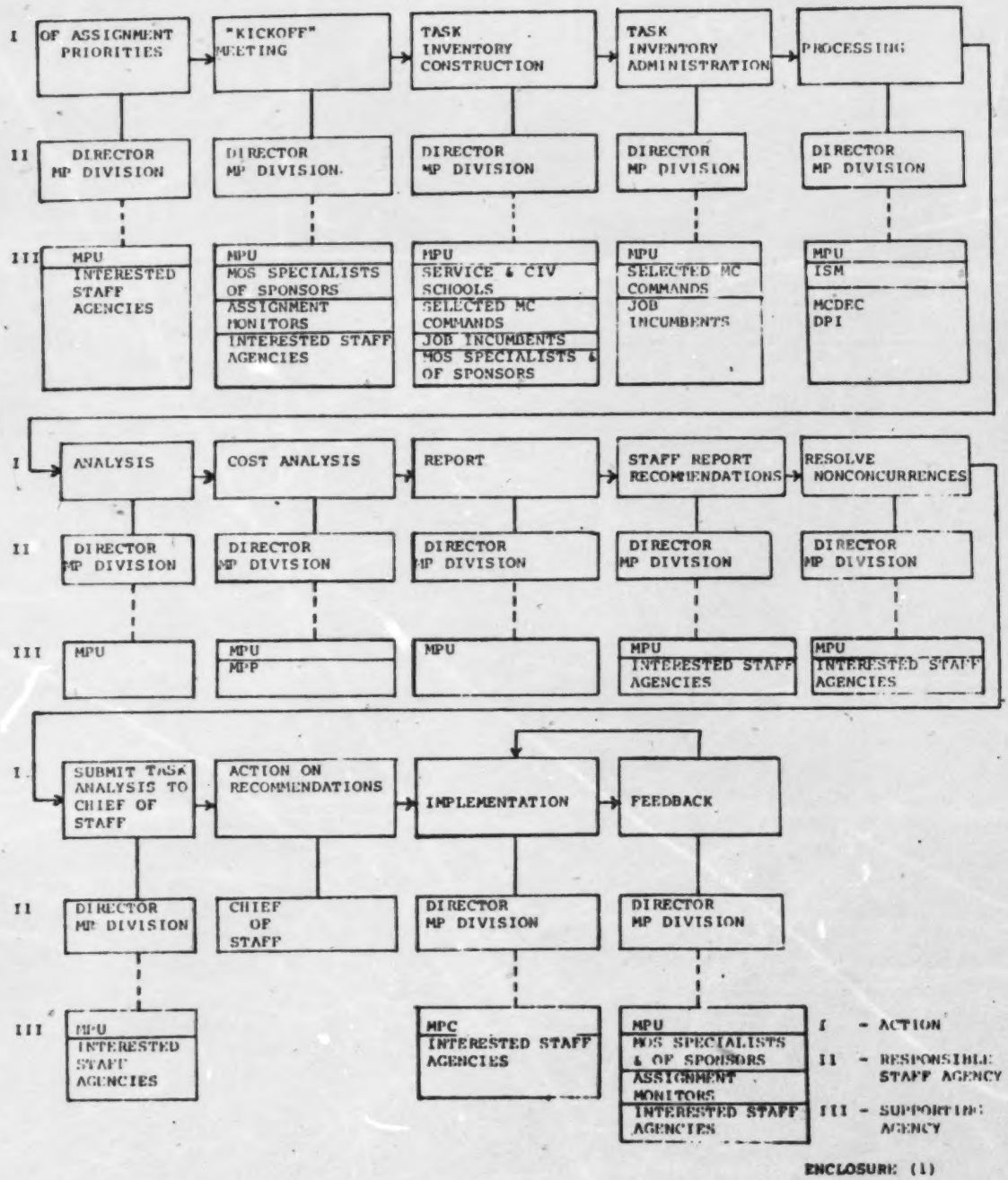


Figure 5. Sequential Flow Chart of the Task Analysis Process

III

OMU'S TASK ANALYSIS ORGANIZATION

OMU is an integral part of Headquarters, United States Marine Corps. It is a field of activity under the Manpower Plans and Policy Division of the Headquarters Marine Corps Manpower Department. Its organizational relationship separates the Office of Manpower Utilization from the Marine Corps Chief of Staff by only two echelons. Thus important conclusions regarding task analysis have an opportunity for review at the highest levels. It may be noted that, organizationally, the Director of Training and Education, also located at the Marine Base, Quantico, is not in the same command chain but is in a parallel relationship.

Staff members of the Office of Manpower Utilization are organized into functional units. Officers and SNCOs are assigned to these units on the basis of their interests, their experiences, and their capabilities as well as on needs of the organization. OMU units are responsible for the completion of individual steps in the TA methodology. Thus within OMU there is a group primarily responsible for data processing. Marines assigned to this group are normally those possessing technical proficiency in computer operations and data analysis, and some are trained in computer programming. Personnel assigned to other units develop their proficiency as a result of training by other OMU personnel. Essentially, the OMU organization is structured to allocate specific responsibility for various portions of the methodology to specific individuals and groups within the OMU staff.

The relationships among the various units in the OMU organization are shown in Figure 6 on Page 25. Figure 6 reflects the organizational structure of OMU in effect at the time this manual is written.

The present organization of OMU is the result of a study of the previous organizational structure conducted by the Cal State LA research team assigned to evaluate the Marine Corps TA Program. The study was a combined effort of the Cal State LA team and the Director and staff of OMU. Various organizational alternatives were evaluated in the study to determine the most effective structure for accomplishing the TA mission. The new organization was established in July, 1975.

In the earlier organization of OMU, officers and SNCOs were assigned to one of three or four TA teams. Each TA team was composed of three officers and five SNCOs and had the full responsibility for carrying out all of the procedures involved in conducting an entire TA study. Each team operated independently and rarely conferred with members of other teams. A team assigned the responsibility for study of an OF operated as a separate unit. It utilized only its own members for performance of all of the steps in the TA process from the initial studies required to construct a task inventory through preparation of the final report and obtaining concurrences from the HQMC organizational units interested in or affected by findings of the study.

The two Study Units in the present organization have responsibilities similar to the earlier teams for the major portion of a TA study. A study unit is responsible for the project from its inception until the preliminary report of findings from study of the OF has been prepared in

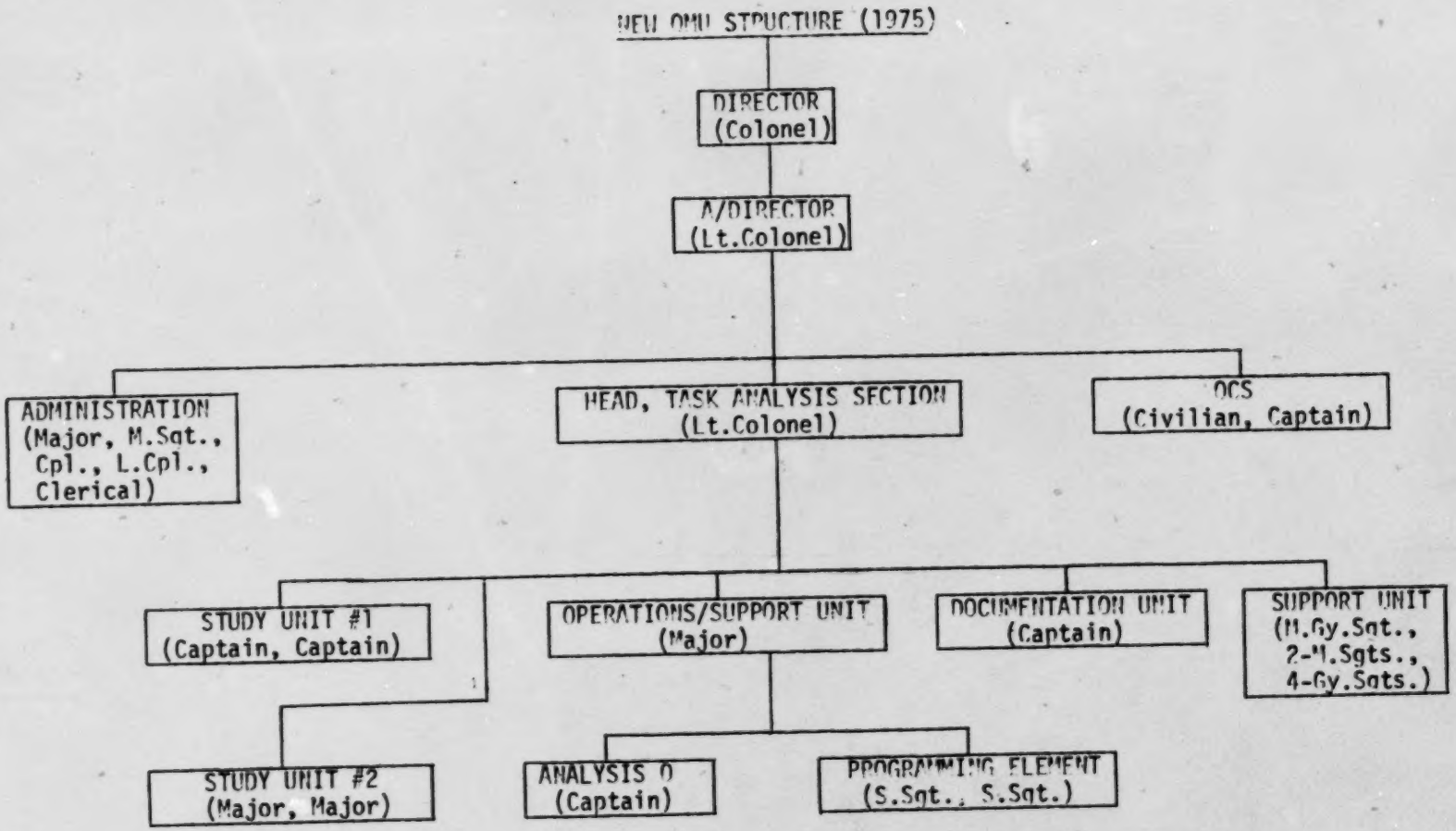


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Figure 6. Organization Chart for the USMC Office of Manpower Utilization

rough draft form. The report is then passed to the Operations/Support Unit for final report writing and for staffing to obtain concurrences. An important difference between the earlier TA teams and the present Study Units is the staffing of the Study Unit. It is comprised of two officers who are Captain or Major in rank, but it has no SNCO's permanently assigned as a part of the unit.

The Study Unit receives temporary augmentation support from the Operations/Support Unit and the Support Unit in the performance of each Task Analysis function. This support includes assistance with observation and interviewing, task inventory construction and administration, data transcription, and similar activities. The Head, Task Analysis Section, allocates personnel resources in support of the two Study Units and in support of the Analysis Officer and the Documentation Officer. Allocations are made in accordance with priorities assigned by the Head, Task Analysis Section.

Within the formal organization, explicit attention is given to specialization. Computer programming, data anlaysis, and documentation (report writing) are specific areas of specialization. Members of the Support Unit are expected to be semi-specialized and concentrate most of their training and effort in one or two TA steps or phases in order to become expert in those areas. At the same time, flexibility is retained in the interest of maximum utilization of personnel resources. This

permits assignment of any Support Unit member to any TA project. The project assignment(s) of a member of the Support Unit may be to one of the Study Units, to the Analysis Officer, to the Documentation Officer, or as otherwise directed by the Head, Task Analysis Section.

The Head, Task Analysis Section, has overall responsibility for all OF studies, and he reports to the Assistant Director. In addition, he is designated as Task Analysis Training Officer. He establishes and conducts, or supervises, all training programs for newly assigned OMU staff members as well as continuing programs of training for all members of the TA Section.

In summary, the center of operational attention is the Study Unit. Each unit plans and organizes a study in a manner similar to that practiced with the previous team concept. The principal difference is that the Operations/Support Unit and the Support Unit provide technical and administrative services, freeing the Study Unit from 1) time-consuming important but routine tasks such as inventory administration, and 2) specialized, high-skill tasks, such as data processing and technical analysis. Specialization is extended to editing final reports and HQMC staffing.

Reference should be made to the Cal State LA research staff's Technical Report No. 6 by those interested in the studies that led to the present OMU organizational structure. This report is entitled, "OMU ORGANIZATION AND PERSONNEL". It discusses earlier problems that caused

attention to be given to possible alternatives to the then existing organization. Several forms of organizing OMU to accomplish its mission are reviewed in the report, and special attention is given to the advantages and disadvantages of the current organizational structure.

BIBLIOGRAPHY

DOD and Marine Corps References

Angle, Harold L., Lt. Col. USMC, THE MARINE CORPS TASK ANALYSIS PROGRAM, a paper presented at the 1974 National Symposium on Task Analyses/Inventories, Ohio State University, November 8, 1975.

Department of Defense, TASK ANALYSIS: CODAP EXECUTIVE OVERVIEW GUIDE, DOD 1125.6-m-1, November 1973.

Department of Defense, TASK ANALYSIS: CODAP ANALYST'S GUIDE, DOD 1125.6-m-111, March 1973.

U.S. Marine Corps, INSTRUCTIONS FOR THE MARINE CORPS TA PROCESS, HQO 1200.2A, October 21, 1975.

U.S. Marine Corps, DESIGN OF COURSES OF INSTRUCTION, Marine Corps Order P1510.23A, November 7, 1972

Technical Reports

Prepared by the ONR-USMC Research Staff
California State University, Los Angeles

NO.

1. Farrell, William T., HIERARCHICAL CLUSTERING: A BIBLIOGRAPHY, July, 1975.

2. Kuriloff, Arthur H., Yoder, Dale, Stone, C. Harold, TRAINING GUIDE FOR OBSERVATION AND INTERVIEWING IN MARINE CORPS TASK ANALYSIS, Training Manual III, August, 1975.

3. Hemphill, John M., Stone, C. Harold, Yoder, Dale, PROGRAM EVALUATION AND REVIEW TECHNIQUE (PERT): A PLANNING AND CONTROL TOOL FOR OCCUPATIONAL FIELD STUDIES, September, 1975.

4. Farrell, William T., Stone, C. Harold, and Yoder, Dale, GUIDELINES FOR RESEARCH PLANNING & DESIGN IN TASK ANALYSIS, September, 1975.

5. Hemphill, John M., Jr., and Yoder, Dale, MANAGEMENT AUDITING, September, 1975.

6. Yoder, Dale, Hemphill, John M., Jr., and Stone, C. Harold, CMU ORGANIZATION AND PERSONNEL, October, 1975.

7. Kuriloff, Arthur H., PRINCIPLES OF TRAINING IN MARINE CORPS TASK ANALYSIS, Training Manual I, December, 1975.

8. Kuriloff, Arthur H. and Yoder, Dale, COMMUNICATIONS IN TASK ANALYSIS, Training Manual IV, October, 1975.

9. Kuriloff, Arthur H. and Yoder, Dale, TEAMWORK IN TASK ANALYSIS, Training Manual V, November, 1975.

10. Hanson, Phillip J., INTRODUCTION TO MARINE CORPS TASK ANALYSIS, Training Manual II, March, 1976.

11. Farrell, William T., Stone, C. Harold, and Yoder, Dale, GUIDELINES FOR SAMPLING IN MARINE CORPS TASK ANALYSIS, March, 1976.

12. Hanson, Phillip J. and Stone, C. Harold, PEACE-TIME TASK ANALYSIS AND ITS RELATION TO WAR-TIME CONDITIONS, April, 1976.

13. Washburn, Paul V., Stone, C. Harold, Judd, Peggy A., and Farrell, William T., THE USE OF WORKER CHARACTERISTICS IN MARINE CORPS CLASSIFICATION AND ASSIGNMENT, May, 1976.

14. Kishi, Akemi, Yoder, Dale, Stone, C. Harold, and Judd, Peggy A., TASK INVENTORY CONSTRUCTION, June, 1976.

15. Farrell, William T., COMPUTER PROCEDURES AND DATA ANALYSIS IN MARINE CORPS TASK ANALYSIS, June, 1976.

16. Stone, C. Harold, EVALUATION OF THE MARINE CORPS TASK ANALYSIS PROGRAM, Final Report, June, 1976.

APPENDIX A

Glossary of Task Analysis Terms

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Glossary of Task Analysis Terms

Average-between: is the average percentage of overlap between all possible pairings of members in Group A (which may be a one-member group) with members in Group B (which may be a one-member group).

Average-within: average amount of similar work performed by all members within a given group.

Background data: personal information, which usually can be verified and is biographical. Examples are: name, grade, base, months in service, educational level, skills such as typing, etc. A background datum also may be an opinion such as: do you plan to re-enlist? Is your job interesting or dull?

Best: a term designating the largest (if maximizing) or smallest (if minimizing) average-between for two groups combining at a given stage in a mathematical clustering process. Essentially, it indicates the similarity (overlap) of the groups which have caused them to combine. (Also see definition of Average-between.)

Case: one man in a study.

Case ID: an external identification, such as service number, assigned to the incumbent answering a questionnaire (survey) booklet.

Case number: an internal sequence number assigned by program INPSTD to each survey booklet as it is processed. This number eventually becomes the values referenced in the "group sequence hierarchy" so that cases may be extracted from a history file.

Cluster: a group of men in a study who clustered because specific overlap and grouping functions were selected by the analyst, as the number of common tasks performed, or the average amount of time spent on all tasks in their jobs. Also spoken of as a "group".

Characteristics: selected items of background data, usually describing personal attributes, such as in "worker characteristics".

Compactness: the average overlap of all members of a group to the job description for that group, measuring the amount of time perfectly described; the larger the compactness value, the more closely the description represents the average job description for the cluster of which he is a member.

CODAP/370: the name of the set of computer programs to perform occupational data analysis on an IBM 370.

Computed variable: a variable whose values for each case are generated by program VARGEN and added to the history file.

Diagonal: usually refers to a matrix and is the intersection of a row and column having the same number.

Difference: the dissimilarity of individuals or clusters with respect to tasks or background data; such information may clarify distinctions between specialty or skill-level groups, with differing experience or training. At times, job types that have been identified may show superficial similarities until differences are highlighted.

Dictionary: a cross-reference list of numerical identifiers to something else, such as to English titles defining variables.

Distribution: An array of individuals spread over a range of some background characteristic or other variable according to the frequency of occurrence; for example: the number who find a job interesting, so-so, or dull.

Duty: a set of tasks comprising a specialty or major function. A person performing a duty when he performs any task in that duty. Duties have broad names such as: Planning & Organizing; Evaluating; Directing & Implementing; Inspecting; Maintaining; Reporting; and so forth.

Element: (1) discrete items or work, such as hand or leg motions, which comprise a task; (2) the single value at a row/column intersection in a matrix.

Factor data: Response values on each task performed and usually of a secondary nature such as: "What portion of this task did you learn from school and what portion from OJT?" or secondary factor.

FDF: Abbreviation for Factor Data File, which is a CODAP data set containing processed factor data.

Factor number: An identifying number assigned to all the factor data of the same kind.

Group: A cluster; a discrete but sometimes arbitrary formation of members according to some evaluating process such as primary response data, or secondary factor data, or background data.

Group Sequence: The arrangement of case numbers in a sequence such that members in discrete groups are listed adjacently. Also called "hierarchy sequence."

Group stage: A numbered event in the clustering process at which a man, or previously formed group of men, is combined with the group which is most similar to it, the result forming a new, larger composite containing all members of the two original clusters. Example: beginning with 200 one-man groups, at stage 199 there will exist 199 one-man groups

and one two-man group. At stage 1, there will be only one group containing 200 composited members.

Grouping: The union of cases at successive stages into fewer and fewer mutually exclusive job clusters, according to some rule of homogeneity. Also called "clustering". For job analysis, the homogeneity usually is the amount of "overlap" of similar work.

HDF: Abbreviation for History Data File.

Hierarchy: The orderly classification of mutually exclusive clusters, wherein each larger unit is a unique combination of the next subordinate units.

History data: All the information pertaining to a particular study.

History variable: Background information; as distinguished from response (work) information. History variables are identified as Vxxx on the HDF.

HMK: An HDF which has been clustered such that the hierarchy data is added to the file; the "M" indicates TIME and the "K" indicates TASK hierarchy.

Homogeneity: the degree of similarity, particularly of the work performed by groups. Also called "similarity". The larger the homogeneity value, the more similar are the jobs of the group members.

Incumbent: Someone performing an assignment, hence holding a job.

Inventory: A detailed list of all tasks that can be performed in a particular job category; usually compiled by the observer team as the first step in a survey.

Job description: A list of specific tasks (or duty summaries) performed by a selected membership, together with the percentage of time spent performing each task and percentage of members performing each task. Different kinds of job descriptions are:

Group job description: the area of specialization identified by the computerized clustering program, where the job descriptions of the members of a group formed during the clustering process are consolidated into an average job description for the group. Such descriptions may be "major job types" or "sub-clusters" or "jobs".

Special job descriptions: the work description of people who are grouped according to similarity of background data and without respect to work performed. Such descriptions describe the work performed by specific people (such as those with a certain length of service, or those with a certain paygrade) and are contrasted

with Group Descriptions in which specific work determines the membership of a group.

Combination Job Descriptions: the composite is formed from cases selected for specific backgrounds within a previously hierarchically formed cluster. This is thus a combination of both SPC and GRP methods. The resultant description is based on both task homogeneity and membership background attributes. For example, within (say) an identified warehouseman job cluster those with a given rank or prior schooling may be further extracted for formulation of a job description. The COB method requires a history file produced by program OVLGRP. All three types of descriptions (COB, GRP, SPC) may be computed at one program execution.

Individual job descriptions: the work performed by a single incumbent, who is selected for review.

JDF: Abbreviation for Job Description File, a CODAP data set on which information gathered on job descriptions of all types is aggregated.

Matrix: An array of quantities in a prescribed form; in CODAP/370 the most common matrices are the "time overlap" and "task overlap" wherein up to 2000 individuals are compared on work data to each other and each matrix element represents the homogeneity of two individuals.

Matrix identification: The nomenclature TIME or TASK applied to an overlap matrix to distinguish which type of similarity computation was used.

Maximizing: The computation process in grouping in which the decision on which men to combine preserves the greatest amount of homogeneity in the resulting composite.

Mean: The arithmetical average of a vector of data, computed as the sum of all observations divided by the number of observations.

Minimizing: Opposite process to maximizing.

Multi-volume file: A computer data set which requires more than one reel of magnetic tape or more than one magnetic disk pack to contain all the data.

Mutually exclusive: cannot both occur together; a process of choice such that if one event in a pair occurs then the other cannot; in clustering, an individual who combines to form a new composite is then considered deleted as a discrete individual and cannot so combine on the same level with another composite; in task analysis, an individual who indicates he does not perform a given element should not subsequently respond that he performs a task which contains the element as a subset.

Order: Arrangement according to some rationale, such as hierarchy order or sort order.

Overlap: The extent (as a percentage) that work performed by one man or group is similar to that performed by another. Usually computed as (1) % time spent performing common tasks; or (2) % of common tasks performed (time excluded).

Primary data: A name usually given to the task response data from a survey.

Questionnaire: The list of background questions and tasks to be completed by selected members in a survey. The resulting "answer sheets" are computer processed and the total data preserved on an HDF.

RDF: Abbreviation for Report Depository File, a data set on which are saved copies of computer printouts which subsequently are reprinted as a book.

Relative time: The percentage of total time an incumbent performs on each task in an inventory, computed by converting a "scale" into a distribution over the individual's task performed. The sum of all relative time is 100%.

Report ID: A 7 or 8 character distinguishing identification given to discrete reports generated by the computer; usually the letters "SP" in the ID indicate a "special" attribute attached to the members reported upon, and the letters "GP" indicate the members were part of a cluster formed by the automatic clustering program.

RRC: Abbreviations for Report Request Card, which is punched by programs which augment an RDF or JDF, such that subsequent use of the card will extract the desired information from the matching file.

Response: the task answers from a questionnaire, or from background answers.

Scale: A numeric range by which task inventories are answered so as to register an incumbent's time performing on a relative basis. Example: 0 = not performed; 1 = performed well below average amount; 4 = average time spent performing; 7 = well above average time spent performing.

Secondary factor: The name used to distinguish any data which is not primary response data. Usually attributed to answers which are subjective in nature such as "do you feel you had enough training in school on this task?" Sets of secondary factor data can be assigned a "factor number".

Similarity: Homogeneity, likeness on some attribute.

Standard deviation: A statistical calculation of the dispersion of some ratings about the mean; sometimes called "sigma"; within one sigma on either side of the mean will be approximately 68% of the events.

Study Identification: An 8 character unique number assigned to all data in a survey in order to avoid mixing of data; each program checks each file to insure that the data to be processed corresponds to the study desired.

Survey: The process of observing a work area and the incumbents, compiling a task inventory, and administering the questionnaire.

TASK matrix: The overlap matrix formed by computing the similarity of each individual to all others on the basis of common tasks performed, without regard to percent time spent performing. Task overlap is then the average of the ratios of common tasks to tasks individually performed, each matrix element being the overlap of two men.

Task: A discrete item of work having a predetermined level or degree of specificity, and which is quantifiable on time spent performing. The total of all tasks comprises the survey inventory.

TIME matrix: An overlap matrix formed by computing the pair-wise similarity of individuals according to the common amount of time spent performing like tasks.

Titles: English descriptions of variables or duties or tasks.

Variable: A quantity that can assume any of a given set of values.

Vector: An array of data usually involving a single rating, such as one column in an overlap matrix which represents the similarity of one man with all others in the survey.

APPENDIX B

Synopsis of CODAP Programs

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Synopsis of CODAP Programs

Each CODAP application (main program) is identified by a unique six character name which usually gives some indication of program purpose. One manner of identifying programs is by major functional classification:

Data preparation and input generation programs

INPSTD - "input standard"; builds first master file from questionnaire data after the raw data was processed by the OCR

VSETUP - "volume setup"; initializes computer tapes or disk packs for receiving subsequent CODAP files

VARGEN - "variable generation"; computes new variable data from combinations of weighted task responses

ADDJOB - "add job to HDF"; adds a job description to a master history file as though the composite was a new individual

INSFAC - "input secondary factor data"; prepares questionnaire data (from the OCR) for further processing by program ASFACT

EXTRCT - "extract" and/or merge many cases from many HDF for the same study onto a new master HDF for further clustering

Overlap/Clustering and job description programs

OVLGRP - "overlap & group"; computes overlap between individuals, then mathematically clusters people into a job hierarchy

JOBDEC - "job descriptions"; computes duty and/or task job descriptions on either: people with similar backgrounds (SPC); or job similarity (GRP); or combinations (COB) of these

OVLJDF - "overlap of job descriptions"; computes the similarity between any type of cluster by overlapping the job descriptions so that the similarity of several may be compared at one time

INDJOB - "individual job descriptions"; computes a task or duty job description with explanatory background information, on selected men who stand out as isolated workers, or who may be representative of the typical member of a cluster

DIAGRM - "diagram clustering"; prints a tree-structured flow-chart of the automatic mathematical clustering process for one job hierarchy as originally computed by OVLGRP

Summarizing programs

GRPSUM - "group summaries"; prints a task summary of several clusters displaying their job descriptions on one page to aid visual analysis

GRPDIF - "group difference"; prints the detail task differences between job descriptions to highlight dissimilarity

GRPMBR - "group membership"; prints a detail report on significant hierarchy values which caused clusters to unite at each stage of the clustering process of OVLGRP

PRITSK - "primary tasks"; prints the performance percentages from several job description groups at a time, reporting the top 'n' tasks on one page to aid visual group comparisons

Report and print utilities

PRTDIC - "print dictionary"; prints a listing of nomenclature describing and defining each background variable

PRTVAR - "print variable values"; prints actual data values for selected background variables for each individual in a study

REPORT - "report editing"; extracts, edits, and reprints reports saved on a master depository file

TITLES - "task titles"; prints a listing of nomenclature describing and defining each duty and task in a study

GRPVAR - "print group variables"; similar to PRTVAR but prints history data for cases in selected hierarchical groups

Statistical calculation programs

VARSUM - "variable summary"; prints frequency counts, means, and standard deviations on selected background variables for several groups at a time

ASFACT - "analysis of secondary factors"; reports statistical data on secondary factor response data for several groups at a time

STPREG - "stepwise regression"; performs stepwise multiple linear regression on up to 35 background and task responses, with multiple recycle capability and forcing/deleting of any variables

An expansion and statement of purpose of each program is given as follows:

ADDJOB - merges a job description onto a history file as an average man

Any job description represents the average work of the composite members of a cluster (whether a SPECIAL, GROUP, or INDIVIDUAL). The maximum limits for mathematically clustering is 2000 men at a time. If large studies have a greater population, then it may be partitioned into subsamples within the limits of program OVLGRP. One or more subsamples are then clustered and a number of representative job descriptions computed by JOBDEC. Program ADDJOB is then used to merge these job descriptions onto an unclustered master history file, where each new cluster will represent a single (but composite) individual. The augmented HDF may then be processed by OVLGRP and the whole cycle repeated until only 2000 (or fewer) individuals and composite remain, these being with the CODAP limits. The program(s) supply the task data but the analyst must supply the adjusted background data which represents the average biography of the composite. This may make the program difficult to use, and program EXTRCT was devised as a substitute.

ASFACT - analysis of secondary factors

Secondary factors are subjective responses to such questions as "do you feel you have (not enough, just right, too much) training on this job?" The terminology "secondary" is to distinguish the data from primary evaluations which are more objective such as "how many hours per week do you spend performing this task?" The secondary factor data usually is collected on the questionnaire booklets on the same lines as the task response data; several different factor questions may be answered for each task. These are collected and processed, a single factor at a time by program INSFAC which prepares the data into a format required by ASFACT. Program ASFACT selects data from this intermediary file, on up to 14 job descriptions

at a time, and reports the frequency distributions of the factor answers, together with means, totals, and standard deviations, columnwise so that all 14 groups may be compared visually on the same page.

DIAGRM - diagram the job hierarchy

The program produces a tree-structured flowchart of how the clusters formed in the overlap/group process (OVLGRP program). This facilitates visual determination of major job types, subclusters, and jobs in the hierarchy. The diagram is connected by vertical bars and horizontal lines, and is printed in multipage columns which may then be joined edgewise. One matrix is produced automatically by OVLGRP using standard starting points. At any subsequent time, the analyst may vary the requisite beginning percentages and minimum membership per starter groups, and produce additional diagrams with more branches (greater detail) or fewer branches (more compact groups which may represent job types of more major proportion).

EXTRCT - subdivide or merge cases to form new population

The program extracts cases from one or more HDF (max of 10 HDF or HMK per run) and merges these into a new HDF. The selection of cases may be on an inclusive or exclusive basis. Output will be in case ID order, provided the original input HDF were in case ID order. All original data in the selected cases is retained on output unless the number of computed variables does not agree between HDF. Among the selection options are: by case sequence number or range; by GRP created by JOBDEC (all cases in that specific hierarchy are selected); by SPC or COB job description; or by time or task hierarchy ranges created by OVLGRP. Use of Job Description selections requires a corresponding JDF for each HDF involved. EXTRCT may be used to "purge" an HDF of unwanted cases. Duplicate cases, even between HDF, are automatically deleted (only the first being retained).

GRPMBR - membership at each hierarchical clustering stage

This report identifies which cases (individuals) merged at each mathematical clustering stage in OVLGRP, and supports the DIAGRM. Information also includes the significant values necessarily being abbreviated on the cluster flowchart. Each print line represents one 'stage' in the reduction of an overlap matrix and identifies the two combining members (or previously formed composites) and the newly formed average group, together with resulting similarity values.

GRPDIF - highlight differences between job descriptions

The program prints the difference between any two selected job descriptions in % of performing each task and number of members performing each task. Various sort sequences are available,

the usual being a sort on largest positive task difference to largest negative difference. This permits better inspection of small differences between the two groups which may be overlooked if only separate listings are used. The differences may be computed on either percent of members performing, or average percent of time spent performing.

GRPSUM - summarize groups by tasks and duties

Either a task summary or a duty summary may be reported, the data being either the % of members performing or the average % of time spent. Several groups of any type may by summarized on a page, to facilitate comparisons. On the task report, each task is identified together with the group percentages; a duty report prints the percentages on the predefined categories selected by the analyst at study genesis; there may be up to 26 duties, each a collection of tasks which the analyst feels are similar in work content, such as Planning, Supervision, Maintenance, etc. Hence "duty" is in itself a summary.

GRPVAR - print variable data for selected job description groups

This program is similar to PRTVAR, but background data is printed only for those cases which comprise any type of job description - that is, a GRP or SPC or COB or IND. Groups are specified by RRC (produced by JOBDEC and/or INDJOB). There must be a JDF containing the requisite description to identify which cases make up the job description group. Output order will be by original case input sequence except as an option for GRP selections, the output order may be by the hierarchies created by OVLGRP; (requires an HMK rather than HDF for this last option.) Any background variables may be printed, as selected by the analyst. Print format across the page is specified by FORTRAN type format punching.

INDJOB - prints an individual job description

Each questionnaire booklet may be considered a complete job description for the answering individual. Program INDJOB prints this description in the same format as other descriptions, and in addition, relevant biographical data is printed with decoding of background data values into English equivalents. Such reports are used to inspect selected cases for possible cause-effect relationships such as for men who become "isolates" in the clustering process - that is, they do not merge into a group until very late because of low similarity. This could be caused by bad data, or a new job type, or work foreign to the general study group. The program also permits various procedures for selecting typical individuals of a job description group from staged clusters for inspection.

INPSTD - organizes "new" data into initial CODAP form

This program builds the master history data file which becomes input to most other programs in the system. The program acts as a general input data supervisor, organizer, editor, and converter, using raw input. The analyst must supply considerable control information, including all the background titles, the duty and task definitions, the task titles, variable value decode titles, and so forth. While this program formats the entire input string into CODAP required form, it cannot supply missing data or correct inaccurate data. The output is the study's HDF, the history data file.

INSFAC - prepare raw data for secondary factor analysis

The program is similar in purpose to INPSTD, operating on raw input from the questionnaires, but formats the data on secondary factors into a form required by ASFACT for further analysis of secondary factors. Editing includes checking for proper control values and case identifications, checking for valid response ratings, deleting cases with zero responses, sequence checking, and matching to case order of the original HDF. The output file is termed the study FDF, or factor data file.

JOBDEC - build job descriptions

Either SPC (special) and/or GRP (group) or COB (combination) descriptions are computed by this program. Specials are based on commonality of background data, while groups are selected from the staging of the job hierarchy computed by OVLGRP. As each description is built, it is saved on the JDF (job description file) which becomes input to many other programs which require cluster designation. Each report furnishes percentage values on (1) % of members performing each task; (2) % of time spent per task by performing members; (3) average % time spent by all members in the group per task; and (4) cumulative % time together with a count of the number of tasks comprising the cumulative. Print data is sorted on any selection of columns 1, 2, or 3 above, or in original input task order. Information about why the cluster was selected is also printed.

OVLGRP - overlap personnel and group into a job hierarchy

This program is an automatic multiple-step calculation of the overlap (similarity) between all individuals in a study, followed by automatic clustering into a job hierarchy (highest overlap, singular population - to smallest overlap, maximum composite population). The calculation process is explained in detail else where in this manual. The program requires the largest expenditure of computer time of all CODAP applications. Operation is normally self contained on disk, however, one magnetic tape may be specified on large populations to preserve the overlap matrix if a segmented run is specified. Either a TIME or TASK process may be used, maximizing or minimizing similarity. TIME maximizing is almost always used for job

analysis, but the process has been applied to other classification data. The program is controlled by a root segment which acts as a calculation supervisor, and successively calls subsupervisors and computational overlays, a total of eleven subroutines. Main functions include: disk formating; overlap matrix generation; clustering; group sequencing; creation of a new HMK (history file with time or task data hierarchy added); a group membership report; and finally printing of a basic cluster diagram using nominal standards for selecting the starter groups to be flowcharted.

OVLJDF - overlap of job descriptions

This program computes the overlap (similarity) of up to 100 job descriptions of any type which were created by JOBDEC. The similarity is the standard type of TIME selection, using column 3 of the description - the average % of all members in the groups. The printout is a 12 x n matrix with column/row headings of the group identifiers. This permits a comparison of the similarity of work described by each group.

PRITSK - report primary tasks

For selected groups of any type, the program acquires the corresponding job descriptions for a JDF (all groups in same study) and selects the top "n" tasks from each; an alternate selection method is to select all tasks from each group that are larger than a specified input percentage. Then a 14 group columnwise report is printed, giving the task and the percentages of each group for that task. If any member of a selected group performs a primary task in his group, then percentages are printed for that task for all groups whether the task was primary for every group or not. This permits visual comparison of what is primary by groups.

PRTDIC - print dictionary of background variable titles

A listing is printed of all background variable titles, in ascending numerical order. These titles describe and define the biographical data on the HDF and the report serves as a reference document.

PRTVAR - print variable values

The analyst selects background variables whose data values for each case on an HDF are to be printed columnwise across a page. The anlyst must also supply column headings, usually as abbreviations of the variable titles, and he must specify a print format. The report is used to inspect actual data gathered in the study, but its greatest usage is when the cases are sorted to hierarchy sequence (which was generated by OVLGRP). The branch DIAGRM or group membership specifies the group sequence for each cluster in the hierarchy as a range of numbers; on the PRTVAR report in this sequence, all

members of a given stage (group) are printed adjacently so that their actual data values are easily inspected for continuity or dissimilarity.

REPORT - extracts, edits, and reprints saved reports

This program's major function is to process an RDF (report depository file) on which many printed reports have been saved. The purpose of the file is to save a report once calculated so that excess computer time is not spent regenerating it every time a copy is needed. Using input "report request cards", the analyst selects and sorts specific reports he wants published; these are extracted from the principal depository, edited if necessary (reduction of total pages) sorted, printed, and/or recorded on a new depository which may then be printed many times to get multiple copies. The new depository will have a table of contents (TOC) and Index on it as the first and last report pages. Also, the analyst may insert "text" for explanation anywhere in the stream, each text report appearing to be a computer generated report.

STPREG - stepwise multiple linear regression

The analyst specifies from two to 35 variables or tasks, one of which is dependent (criterion) and the others independent (predictors). The program gathers observations (data points) for each variable or task from the HDF (history dile) and commences a stepwise regression calculation. Each variable is entered into the regression, one at a time, the current selection being that variable which reduces the sum of the squares of the deviations the most. Certain data standards are required, such as all numeric data, means greater than .01, standard deviations greater than .001, and a minimum percentage of data points per variable (controlled externally). The program will recycle to allow another variable to be named dependent, or to permit forcing or deletion of any number of variables.

TITLES - print duty and task titles

The program prints a double column report of all duty and task titles which are alphabetically recorded on a history file, in alphabetical task order within duties. This serves as a reference list, giving the nomenclature which describes and defines each task response.

VARGEN - generate new variable values from weighted task data

The program generates new Cxxx variables for each case on an HDF, by combinations of weighted task response data. Five different formulas are programmed for user selection. The new variable data is added to each case and the whole history file copied onto a new HDF. The analyst must supply a vector of weights (one weight value for each task) and a scale factor for the formula chosen. VARGEN is used to create adjusted

data from old data when further analysis is desired on the combined effect of task responses.

VARSUM - print statistics on selected background variables

A report is printed on the distribution of background data for all cases in a study, or for all members which belong to selected job description groups. Several groups may be selected for one computer run, and printed on the same page for visual comparison of background statistics. The printed data includes frequency counts, means, and standard deviations, and subtotals and number of missing points. Coded values may be converted before printing into English equivalents for better visual enhancement of the output. The variables selected may be counted as exact matches, or exact ranges, or in computer generated intervals.

VSETUP - volume setup

The program is executed early in a study, and prepares two data sets for receiving subsequent CODAP files; these are the JDF and RDF. The files are initialized with CODAP passwords, and cataloged in the machine system.

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